

TITLE

SYSTEM AND METHOD FOR OPTICAL DISC DRIVE ADJUSTMENT

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to a system and method for optical disc drive adjustment, and in particular to obtain an optimum tilt angle using the persistence of vision effect during a packaging process.

Description of the Related Art

10 An optical pickup head of an optical disc drive, such as a DVD-ROM player, a DVD Player, or a CD-ROM drive, is an important component for data access. A tilt angle between an optical axis of the optical pickup head and an optical disc is defined for disc use. Obtaining a 15 given tilt angle by precise component control, affects yield rates and product cost, requiring a mechanism to adjust the tilt angle with a given range.

FIG. 1 is a schematic diagram of a conventional structure of an optical disc drive. An optical disc drive comprises an optical pickup head 11, which accesses data from a optical disc, an accessing mechanism 12, which moves optical pickup head 11, a rotating mechanism 13, to maintain stable optical disc rotation, and a circuit board 14, which processes signals. Accessing mechanism 12 comprises two leader pins 15, providing primary and secondary movement respectively, which can be represented as a datum plane for optical pickup head 11. Generally, the height of one end of the primary leader

pin is fixed, while the other end is adjustable. Conversely, one or both ends of the secondary leader pin are adjustable, and the datum plane is inclined by adjusting the relative height of both leader pins 15.

5 When an optical disc is placed on rotating mechanism 13, the optical disc and the datum plane of both leader pins 15 form a tilt angle and sway generated by incorrect placement and the rotating mechanism 13 itself.

In the first adjustment procedure during the optical drive packaging process, optical drive components are adjusted with tilt angles and sway using an autocollimator at a workstation, comprising a rotary disc a spindle motor, on which an optical disc is placed,. A reflector is located under the autocollimator to sense 15 sway and tilt angle of the rotary disc and the datum plane thereof, represented by leader pins, supporting an optical pickup head, and are adjusted until the tilt angle is zero. In the second testing procedure, the jitter value of the optical pickup head is determined by 20 a jitter meter at another workstation, in which a test disc is placed on the rotary disc to read radio frequency (RF) signals from the optical pickup head using the jitter meter, to determine whether jitter values are within a fixed range.

25 The adjustment procedures described above have several disadvantages, as described in the following. The jitter meter cannot immediately determine the optimum jitter value of the optical pickup head due to interference caused by noise. Additionally, because the 30 jitter meter indicates the measured jitter value with

sway it is difficult to determine whether the optimum jitter value has been obtained, and requires several measurements to obtain the optimum bottom jitter value. Further, different types of optical discs have different 5 optical paths, and the datum plane of each must be adjusted before the optical pickup head can access them. Finally, tilt angle, sway and jitter adjustment cannot be performed simultaneously.

SUMMARY OF THE INVENTION

10 Accordingly, an object of the present invention is to provide a system and method for optical disc drive adjustment that simultaneously adjusts tilt angle, jitter, and sway using the persistence of vision effect.

Another object of the invention is to provide a 15 system and method for adjusting optical drives, particularly for adjusting optical pickup head components to achieve optimum tilt angle in accordance with individual discrepancies.

According to the objects described, the present 20 invention provides a system for adjusting optical disc drives. The system includes an optical disc drive component comprising a rotating disc and a reflector located on the rotating disc. The system further provides a monitor with a switch box, coupled thereto, an 25 autocollimator, coupled to the switch box, located above the rotating disc, to sense the tilt angle of the reflector on the rotating disc. Signals are transmitted to the switch box to display a first bright spot on the monitor. A host is coupled to the switch box, to

calculate the tilt angle of the optical drive component and transmitting signals to the switch box to display a second bright spot on the monitor. An adjustment mechanism for adjusting the optical drive component and 5 switching signals from the autocollimator and the host using the switch box, enabling the first bright spot from the autocollimator to coincide with the second bright spot from the host.

The present invention further provides a method for 10 adjusting optical disc drives. A tilt angle of a rotating disc located on top of a spindle motor is sensed by an autocollimator. A bright spot is output to a monitor through a switch box. A host calculates a tilt angle of an optical pickup head. Another bright spot is 15 output to the monitor through the switch box. Finally, the autocollimator adjusts the first bright spot to coincide with the bright spot from the host to obtain an optimum tilt angle of the optical drive.

A detailed description is given in the following 20 embodiments with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying 25 drawings, wherein:

FIG. 1 is a schematic diagram of a conventional optical disc drive structure;

FIG. 2 is a schematic diagram showing the architecture of an adjusting system according to the present invention; and

FIG. 3 is a schematic diagram showing bright spots 5 from an adjusting system displayed on a monitor according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 2 is a schematic diagram showing the architecture of an adjusting system according to the 10 present invention. The present invention performs an adjusting process on an optical disc drive component 20, comprising an autocollimator 21, a reader 22, a host 23, a switch box 24, and a monitor 25. Optical drive component 20, composed of a spindle motor 201 with a 15 rotating disc 202 thereon, is located on a testing tool (not shown), in which spindle motor 201 is placed on a board 205 under which an adjusting mechanism 207 is located with leader pins at each side. An optical pickup head 204 is located on leader pins 206 for lead and 20 movement and the bus line of spindle motor 201, together with that of optical pickup head 204, is connected to a PC control board for tilt angle, sway, and jitter 25 adjustments.

In addition, the output of autocollimator 21 located 25 above the rotating disc 202 with reflector 203 thereon is transmitted to the switch box 24 via a transmission line 31. Autocollimator 21 receives optical reflection signals from reflector 203 to sense a tilt angle of rotating disc 202. Reader 22 reads out a tilt angle when

optical pickup head 204 obtains an optimum jitter value (provided by the optical pickup head manufacturer) using a bar code reader and the tilt angle is calculated using an algorithm by host 23 for a desired tilt angle. The 5 output of host 23 is transmitted to switch box 24 via a transmission line 32 and that of switch box 24 is transmitted to the monitor 25 via a transmission line 34, in which switch box 24 is a TV tuner comprising two input signal sources, the autocollimator, and the host 10 separately. In addition, switch box 24 can be switched, manually or electronically, to output one of the two input signals through an output port to be displayed on monitor 25, in which the monitor is a CRT (cathode ray tube) monitor or an LCD (liquid crystal display).

15 The bar code content represents the tilt angle when the optimum jitter value of the optical pickup head 204 is read by reader 22 and input to the host 23. Next, the bar code content is calculated using an algorithm based on the different optical paths required by a CD, DVD, or 20 other optical disc through host 23, obtaining a tilt angle that enables optimum performance, and then a bright spot (referred to as a target point hereinafter) is output through switch box 24 to be displayed on monitor 25. The autocollimator 21 then senses the current tilt 25 angle of rotating disc 202, emits a light beam to reflector 203 on rotating disc 202, and receives optical signals from the reflector 203, in which the reflected signals are output through switch box 24 to display a further bright spot (referred to as an adjustment point 30 hereinafter) on the monitor 25. The adjustment point

indicates the current inclined position of rotating disc 203, adjusted to overlap the target point completely to obtain an optimum tilt angle of optical drive component 20.

5 FIG. 3 is a schematic diagram showing a monitor through an adjusting system according to the present invention. According to the method of the present invention, a tilt angle with an optimum jitter value is obtained through host 23 and a first bright spot, 10 represented as point A, is output to the monitor 25. In addition, autocollimator 21 senses optical signals from reflector 203 to obtain the tilt angle and sway of rotating disc 202 and a second bright spot, represented as point B, is output according to the tilt angle and the 15 sway to be displayed on monitor 25. Optical drive component 20 is then adjusted by adjustment mechanism 207 to move point B to completely overlap point A. The points A and B, however, are switched by performing a high-speed switch operation using the persistence of 20 vision effect. Conversely, if point A is obtained, displayed and its position marked first on monitor 25, point B is then switched by switch box 24 to display at another position on the monitor 25, in which both points are adjusted gradually by adjustment mechanism 207 until 25 point A coincides with point B.

Accordingly, compared to conventional methods, the method of the present invention can adjust optical drives without the requiring two adjustment procedures at work stations, by displaying a bright spot calculated in 30 accordance with a tilt angle and sway of rotating disc

202 and another from optical pickup head 204, calculated by host 23. Therefore, the two bright spots are switched by switch box 24 to be displayed on monitor 25, and are adjusted to coincide by adjustment mechanism 207, thus
5 enabling faster adjustment of optimum tilt angles during the packaging process. In addition, conventional methods only adjust a rotating disc and a datum plan of leader pins to the same datum plane. Put simply a jitter meter determines whether a jitter value is within a certain
10 range when a value of the tilt angle is zero, and is unable to adjust the tilt angle to meet the requirements of different optical paths required by different types of optical discs, CDs and DVDs, for example. Nevertheless, the present invention obtains different desired tilt
15 angles according to the optical paths of different types of optical discs using an algorithm stored in host 23 after reading tilt angles with optimum jitter values obtained by optical pickup head 204, and establishes a database to compensate for differences between individual
20 components of an optical disc drive and performing adjustment operations to achieve optimum tilt angles.

Thus, the advantages of the method and system of the present invention are that bright spots are displayed on a monitor using the persistence of vision effect, enabling operators to recognize whether an optimum tilt angle of an optical disc drive is obtained. Next, a desired tilt angle required by the leader pins and a packaged rotating disc are adjusted in accordance with a tilt angle with an optimum jitter value obtained from
30 each optical pickup head (for example, different optical

paths are required when an optical pickup head reads CD or DVD discs). Finally, different positions of tilt angles are acquired by a host and a database is established with different algorithms to satisfy 5 requirements of each optical pickup head.

While the invention has been described by way of example and in terms of the preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. To the contrary, it is intended 10 to cover various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.